PROJECT BASIE

PRELIMINARY STORMWATER DESIGN CONCEPT REPORT

Butteville Road
Woodburn, OR

Prepared: May 24, 2021
By:
Christie Johnson, EI &
Chad Heimbigner, P.E., LEED AP
Coffman Project No. 210598

Prepared By:

COFFMAN ENGINEERS

10 N. Post Street, Suite 500
Spokane, WA 99201
(509) 328-2994 v.
(509) 328-2999 f.

TABLE OF CONTENTS

ATTACHMENTS

PROJECT DESCRIPTION

Project Basie includes the construction of a large warehouse facility, paved parking lots, paved vehicle circulation, pedestrian walkways, and paved receiving areas. Located east of Butteville Road, the project includes installing new utility services (domestic and fire suppression water, gas, irrigation, sanitary sewer, telecommunications, and power), parking areas, paved access routes, concrete curbs, sidewalks, storm water management improvements, and landscaping. New curbs and sidewalks will be installed to provide accessible pedestrian routes between the building and parking lots, and right-of-way. The site will include paved vehicle circulation to provide efficient and convenient access throughout the project site.

The project also includes off-site utility extensions (sewer, water, and storm) and road upgrades to the frontage along Butteville Road, including road widening, paved pedestrian walkways, concrete curbing, stormwater management improvements, and landscaping.

The property is bounded by Butteville Road to the west, warehouses to the east, State Highway 219 to the north, and undeveloped land to the south. The project is located in the City of Woodburn, Sections 11 and 14, Township 5 South, Range 2 West, W.M., City of Woodburn, Marion County, Oregon (see Vicinity Map, Attachment “A”).

PRE-DEVELOPMENT SITE CONDITIONS

The existing site is undeveloped and is relatively flat with about 15 feet of elevation change from south to north. The existing site is predominantly cultivated fields, with minimal slopes. The lowest elevation is located in the northwest corner of the site and the highest elevations are located in the south portion of the site. Stormwater runoff follows the natural landscape and flows southwest to northwest towards the low spot of the project site. An existing wetland and seasonal creek, Senecal Creek, are located adjacent to the northwest corner of the site. Stormwater from the site surface flows to the low spot of the project site and infiltrates into the existing wetlands and Senecal Creek. There do not appear to be any existing treatment facilities for the existing stormwater runoff.

SOIL INFORMATION

Preliminary soil information for the existing soils is provided via Web Soil Survey by the Natural Resources Conservation Services (NRCS). The Web Soil Survey indicates the existing site is predominantly Woodburn silt loam, hydrologic soil group C. Soils classified as hydrologic soil group D are also found on-site based on previous geotechnical reporting (GeoDesign, 2016). Therefore, the majority of the site soils have low infiltration rates when saturation occurs. Refer to Attachment “B” for additional information regarding NRCS Web Soil Survey Information for the existing soils. Groundwater was observed in preliminary geotechnical explorations however proposed improvements will not impact or contaminate existing groundwater conditions.

DOWNSTREAM ANALYSIS

Metered release and overflow stormwater runoff from the proposed development will discharge to the existing wetland and seasonal creek, Senecal Creek, located adjacent to the northwest corner of the site. The stormwater runoff will discharge to Senecal Creek at one single discharge point for the entire development. Refer to Attachment “C” for additional information regarding TMDL and 303(d) listings for Senecal Creek, per Oregon’s 2012 Integrated Report by the DEQ. Discharge from

the proposed project shall not impact the existing concentrations listed. The rate of runoff into the creek will be less than 2 feet per second per DEQ requirements.

Stormwater best management practices (BMPs) will be installed to eliminate site pollutants (oil, trace metals, sediment, etc.) from entering receiving water bodies. The BMPs installed for the post-development management system will be adequately operated and maintained. An Operations and Maintenance Manual will be created for the final stormwater management report. BMPs will also be installed during construction to protect existing adjacent water bodies and monitor pH levels of the existing soils due to on-site cement mixing during construction.

METHODOLOGY

Storm water management is provided in conformance with the City of Woodburn Storm Drainage Master Plan (SDMP), Marion County's Engineering Standards, Oregon Department of Transportation (ODOT) Standards, and the Standard Local Operating Procedures for Endangered Species (SLOPES V, 2014) developed by the National Marine Fishery Service (NMFS).

The Santa Barbara Urban Hydrograph (SBUH) Method is used to determine the water quality, storage volume, and flow control requirements – with a 2-year, 25-year, and 100-year return frequency, respectively. The total runoff rate from the post-development site will be limited to the 5-year pre-development runoff rate. The SBUH Method is used to find the peak flow runoff rate for both the pre-development and post-development conditions, utilizing precipitation values from the NOAA precipitation Atlas. Refer to Attachment "C" for precipitation table.

Stormwater runoff from the post-developed site will be handled by one or more biofiltration swales, sized per the City of Woodburn Storm Drainage Master Plan (SDMP) requirements. The swales will be designed to treat and store stormwater runoff from the water quality and detention storm events, as well as function as flow control facilities. The swales will treat the 2-year, 24-hour water quality storm event, based on 50% of the NOAA 24-hour precipitation for a 2-year storm event. The swales will detain the entire 25-year, 24-hour detention storm event, based on the NOAA 24-hour precipitation for a 25-year storm event. The swales will adequately handle both the 2-year and 25-year design storms, respectively. In addition, the proposed storm system will adequately pass the 100-year design storm event.

POST-DEVELOPMENT STORMWATER MANAGEMENT APPROACH

ON-SITE

The on-site development consists of a warehouse building, paved vehicle and pedestrian access, paved parking areas, and landscaping. The following table summarizes the on-site impervious and pervious areas, based on preliminary site plan design concepts.

POST-DEVELOPED ON-SITE BASIN INFORMATION SUMMARY TABLE

Basin Area	Asphalt (CN[1] =98)	Roof (CN[1] =98)	Sidewalks (CN[1] =98)	Lawns (CN[1,2] =81)	Total Area (acres)
On-Site	36.45	18.82	2.16	24.38	**81.81**

1 Curve Numbers from Autodesk Storm and Sanitary Analysis (SSA) software (See Supporting Figures, Attachment "C")
2 A conservative, blended curve number for lawns assuming 50% soil group C and 50% soil group D was used based on preliminary soil information.

The stormwater runoff from the on-site improvements will be collected, conveyed, and discharged north to a large on-site swale for temporary storage and treatment. Runoff from the south, west, and east parking and vehicular access will surface flow to drainage structures located at low areas on-site and conveyed through multiple storm mains running south to north. The storm mains will also convey roof runoff from the building. The storm mains will discharge north, to the large on-site swale for temporary storage and treatment. Runoff from the north parking and vehicular access areas will also be directed to storm structures and discharged north to the large on-site swale.

The following table summarizes the north swale geometry, based on preliminary site plan design concepts.

PRELIMINARY ON-SITE SWALE GEOMETRY SUMMARY TABLE

Swale	Bot. Elevation Area (sf)	Top of Swale Area (1' of Freeboard) (sf)	Total Volume (3-foot max depth) (cf)
On-Site North	230,243	274,125	739,856

Runoff from the on-site improvements will discharge into the north on-site swale and be regulated by various flow control outlets. Runoff in the swale will temporarily pond until it reaches a metered outflow release orifice, set at an invert elevation above the treatment depth. An additional overflow weir, set at an appropriate elevation, will regulate high runoff rates and prevent overtopping in the occurrence of a 100-year storm event. A subsurface gallery with associated perforated pipes, located below the swale, will assist with exfiltration through the bottom of the swale and will allow the swale to completely drain within 48 hours of a storm event. In the event of high groundwater, the subsurface gallery will also maintain the treatment and storage function of the north on-site swale.

The following tables summarize the results of the hydrology calculations. The runoff rate and maximum ponding depth in the swale was calculated using the Santa Barbara Urban Hydrograph (SBUH) Method. The calculations were performed utilizing Autodesk Storm and Sanitary Analysis (SSA) software. See hydrology calculations in Attachment "D".

ON-SITE WATER QUALITY AND DETENTION SUMMARY TABLE

Storm Event	Peak Runoff Rate[1,2] (cfs)	Ponding Depth in On-Site North Swale[3] (ft)
2 Year (Water Quality)	15.30	0.98
25 Year	68.78	2.40
100 Year	78.98	2.59

1 Peak Runoff Rate based on precipitation rates per NOAA Precipitation Atlas (See Supporting Figures, Attachment "C")
2 Runoff calculated using the Santa Barbara Urban Hydrograph (SBUH) Method.
3 Maximum treatment depth of 1 foot and maximum detention depth of 3 feet per City standards

OFF-SITE

The off-site development consists of frontage improvements to Butteville Road, including road widening, paved pedestrian walkways, concrete curbs, and stormwater management improvements including swales, catch basins, and piped conveyance. Depending on final swale bottom elevations relative to groundwater surfaces, subsurface galleries with perforated pipes may be installed to facilitate drainage of the swales.

Potential future off-site development improvements for Butteville Road and Highway 219 are not included in this report and will be addressed in future documentation.

The following table summarizes the off-site impervious and pervious areas, based on preliminary site plan design concepts.

POST-DEVELOPED OFF-SITE BASIN INFORMATION SUMMARY TABLE

Basin Area	Asphalt (CN[1] =98)	Roof (CN[1] =98)	Sidewalks (CN[1] =98)	Lawns (CN[1,2] =81)	Total Area (acres)
Off-Site	1.83	-	0.31	0.29	**2.43**

1 Curve Numbers from Autodesk Storm and Sanitary Analysis (SSA) software (See Supporting Figures, Attachment "C")
2 A conservative, blended curve number for lawns assuming 50% soil group C and 50% soil group D was used based on preliminary soil information.

The off-site runoff from the frontage improvements will be directed to adjacent roadside swales along Butteville Road for temporary storage and treatment. The stormwater runoff from the off-site improvements will temporarily pond in each roadside swale, until it reaches a metered outflow structure, set at an elevation above the treatment depth. Once this occurs, storm water will discharge to a storm water main located within Butteville Road, and discharge north to a regulated outflow structure to Senecal Creek.

The following table summarizes the swale geometry, based on preliminary site plan design concepts.

PRELIMINARY OFF-SITE SWALE GEOMETRY SUMMARY TABLE

Swale	Bot. Elevation Area (sf)	Top of Swale Area (1' of Freeboard) (sf)	Total Volume (1-foot depth) (cf)
Off-Site Roadside 1	41	332	187
Off-Site Roadside 2	615	4,348	2,482
Off-Site Roadside 3	244	1,749	997
Off-Site Roadside 4	1,074	7,561	4,318
Off-Site Roadside 5	53	133	93

The following tables summarize the results of the hydrology calculations. The runoff rate and maximum ponding depth in the swales were calculated using the Santa Barbara Urban Hydrograph (SBUH) Method. The calculations were performed utilizing Autodesk Storm and Sanitary Analysis (SSA) software. See hydrology calculations in Attachment "D".

OFF-SITE WATER QUALITY AND DETENTION SUMMARY TABLE

Storm Event	Peak Runoff Rate[1,2] (cfs)	Ponding Depth in Off-Site Swales (ft)
2 Year (Water Quality)	0.55	0.98
25 Year	2.16	0.84
100 Year	2.45	0.92

1 Peak Runoff Rate based on precipitation rates per NOAA Precipitation Atlas (See Supporting Figures, Attachment "C")
2 Runoff calculated using the Santa Barbara Urban Hydrograph (SBUH) Method.

OUTFALL TO SENECAL CREEK

The total regulated runoff from the on-site orifice, overflow weir, and subsurface gallery, as well as the regulated off-site orifice, will combine and discharge at one single discharge point to Senecal Creek. The entire post-development runoff rate to Senecal Creek will not exceed the pre-development 5-year runoff rate. The following tables summarize the results of the combined flow control calculations. See hydrology calculations in Attachment "D".

OUTFLOW FLOW CONTROL SUMMARY TABLE

Total Proposed On-Site Metered Outflow (cfs)	Total Proposed Off-Site Metered Outflow (cfs)	Total Post Dev Peak Outflow (cfs)	Total Pre-Development (5 Year) Peak Flow[1,2] (cfs)
21.51	0.74	22.25	23.02

1 Peak Runoff Rate based on precipitation rates per NOAA Precipitation Atlas (See Supporting Figures, Attachment "C")
2 Runoff calculated using the Santa Barbara Urban Hydrograph (SBUH) Method.

Refer to the Preliminary Overall Drainage Plan in Attachment “E” for additional information.

CONVEYANCE

The stormwater conveyance systems for on-site and off-site will follow the Marion County requirements. Stormwater piping will be sized to adequately convey the 25-year storm event with a minimum velocity of 3 feet per second. The conveyance system and associated pipe calculations will be included with the final stormwater drainage report.

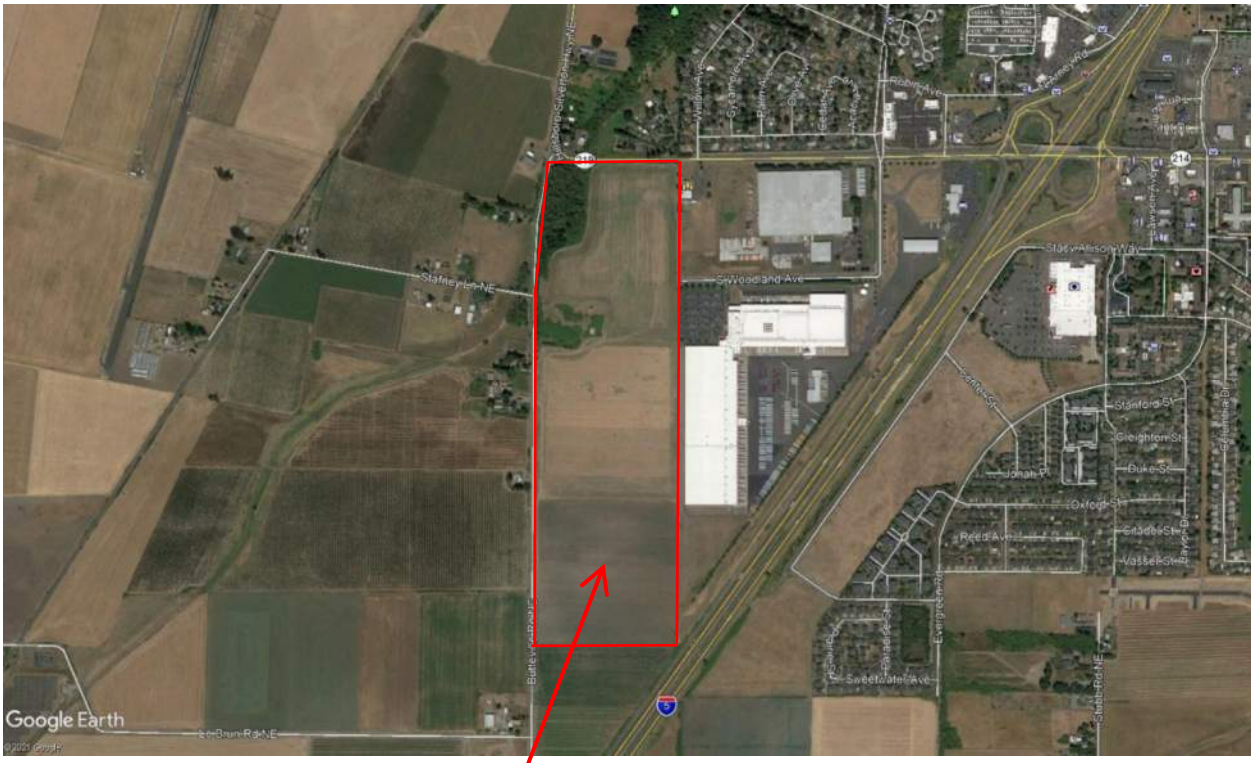
CONCLUSION

The above-described system of stormwater control explains the preliminary stormwater management approach for the Project Basie project. The system shall provide adequate water quality, detention, and meet flow control requirements.

See attachments for additional information.

VICINITY MAP

ATTACHMENT “A”

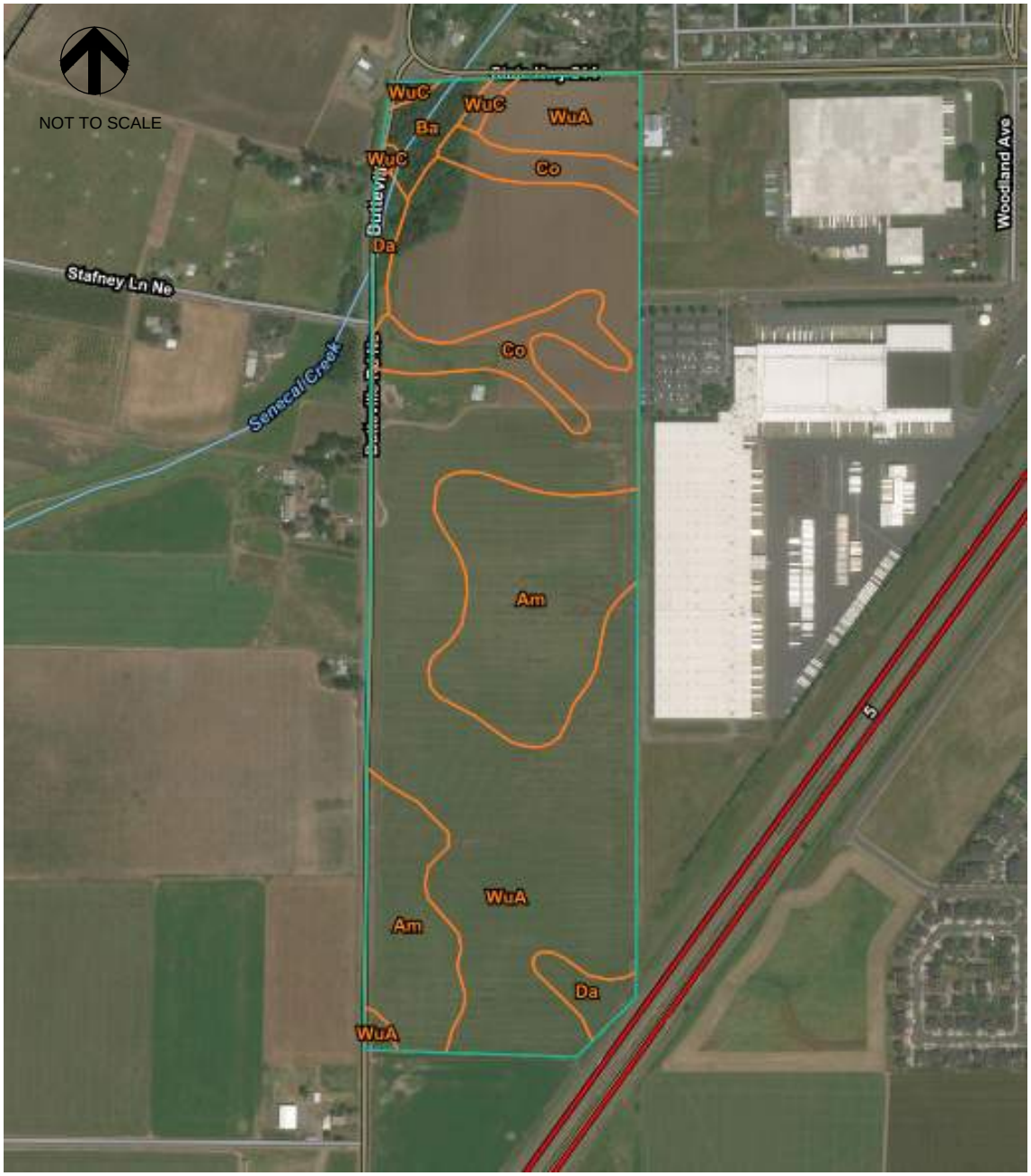


VICINITY MAP

ATTACHMENT “A”

NRCS WEB SOIL SURVEY INFORMATION

ATTACHMENT “B”



Map Unit Legend

Marion County Area, Oregon (OR643)

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Am	Amity silt loam	27.3	23.2%
Ba	Bashaw clay	2.6	2.2%
Co	Concord silt loam	8.5	7.2%
Da	Dayton silt loam	3.4	2.9%
WuA	Woodburn silt loam, 0 to 3 percent slopes	74.6	63.5%
WuC	Woodburn silt loam, 3 to 12 percent slopes	1.1	0.9%
Totals for Area of Interest		**117.5**	**100.0%**

COFFMAN ENGINEERS
10 N. Post Street, Suite 500
Spokane, WA 99201
ph 509.328.2994
www.coffman.com

TITLE: NRCS WEB SOIL SURVEY INFORMATION

PROJECT: PROJECT BASIE

SHEET NO: EX. 1

PROJ. NO. 210598
DATE 04/12/2021

CHECKED CJH
DRAWN CLJ

SUPPORTING FIGURES

ATTACHMENT “C”

Storm Event	NOAA 24-HR Precipitation (inches)
2 year	2.4
5 year	3.0
10 year	3.5
25 year	4.0
100 year	4.5

Water Body	TMDL or 303(d) Listing
Senecal Creek	BHC Gamma
	Chlorophenoxy Herbicide - Silvex
	Chlorophenoxy Herbicide
	Chlorpyrifos
	Dissolved Oxygen
	Guthion
	Malathion
	Parathion

NOAA PRECIPITATION ATLAS SUMMARY and TMDL - 303(d) LISTING BY DEQ

ATTACHMENT “C”

SCS Curve Numbers for Urban Areas[1]					
Cover Description		Curve Numbers for Hydrologic Soil Group			
Cover Type and Hydrologic Condition	Average Percent Impervious Area[2]	A	B	C	D
Fully Developed Urban Areas (Vegetation Established)					
Open Space (Lawns, Parks, Golf Courses, Cemeteries, etc.):[3]					
Poor condition (grass cover <50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover >75%)		39	61	74	80
Impervious Areas:					
Paved Parking Lots, Roofs, Driveways, etc.					
(excluding right-of-way)		98	98	98	98
Streets and Roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western Desert Urban Areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban Districts:					
Commercial and business	85%	89	92	94	95
Industrial	72%	81	88	91	93
Residential Districts by Average Lot Size:					
1/8 acre or less (town houses)	65%	77	85	90	92
1/4 acre	38%	61	75	83	87
1/3 acre	30%	57	72	81	86
1/2 acre	25%	54	70	80	85
1 acre	20%	51	68	79	84
2 acres	12%	46	65	77	82
Developing Urban Areas					
Newly Graded Areas:					
(pervious areas only, no vegetation)[5]		77	86	91	94

[1]Average runoff condition, and Ia = 0.2S.

[2]The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4 of Technical Release 55, Urban Hydrology for Small Watersheds, USDA, June 1986.

[3]CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

[4]Composite CN's for natural desert landscaping should be computed using figure 2-3 or 2-4 of Technical Release 55, Urban Hydrology for Small Watersheds, USDA, June 1986, based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

[5]Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 of Technical Release 55, Urban Hydrology for Small Watersheds, USDA, June 1986, based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

CURVE NUMBER

ATTACHMENT “C”

SCS Curve Numbers for Cultivated Agricultural Lands[1]

Cover Description			Curve Numbers for Hydrologic Soil Group			
Cover Type	Treatment[2]	Hydrologic Condition[3]	A	B	C	D
Fallow	Bare Soil	-	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Raw Crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR+CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C+CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T+CR	Poor	65	73	79	81
		Good	61	70	77	80
Small Grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR+CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C+CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T+CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-Seeded	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

[1]Average runoff condition, and Ia = 0.2S.
[2]Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.
[3]Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good >= 20%), and (e) degree of surface roughness.
Poor: Factors impair infiltration and tend to increase runoff.
Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

CURVE NUMBER CONTINUED

SCS Curve Numbers for other Agricultural Lands[1]

Cover Description		Curve Numbers for Hydrologic Soil Group			
Cover Type	Hydrologic Condition	A	B	C	D
Pasture, Grassland, or Range - Continuous Forage for Grazing[2]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow - Continuous Grass, Protected from Grazing and Generally Mowed for Hay	-	30	58	71	78
Brush - Brush-Weed-Grass mixture with Brush the Major Element[3]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30[4]	48	65	73
Woods - Grass Combination (Orchard or Tree Farm)[5]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods[6]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30[4]	55	70	77
Farmstead - Buildings, Lanes, Driveways, and Surrounding Lots	-	59	74	82	86

[1]Average runoff condition, and Ia = 0.2S.
[2]Poor: <50% ground cover or heavily grazed with no mulch.
Fair: 50% to 75% ground cover and not heavily grazed.
Good: >75% ground cover and lightly or only ocassionally grazed.
[3]Poor: <50% ground cover.
Fair: 50% to 75% ground cover.
Good: >75% ground cover.
[4]Actual curve number is less than 30; use CN = 30 for runoff computation.
[5]CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.
[6]Poor: Forest litter, small tress, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

SCS Curve Numbers for Arid and Semiarid Rangelands[1]

Cover Description		Curve Numbers for Hydrologic Soil Group			
Cover Type	Hydrologic Condition[2]	A[3]	B	C	D
Herbaceous - Mixture of Grass, Weeds, and Low-Growing Brush, with Brush the Minor Element.	Poor	-	80	87	93
	Fair	-	71	81	89
	Good	-	62	74	85
Oak-Aspen - Mountain Brush Mixture of Oak Brush, Aspen, Mountain Mahogany, Bitter Brush, Maple, and other Brush.	Poor	-	66	74	79
	Fair	-	48	57	63
	Good	-	30	41	48
Pinyon-Juniper - Pinyon, Juniper, or both; Grass Understory.	Poor	-	75	85	89
	Fair	-	58	73	80
	Good	-	41	61	71
Sagebrush with Grass Understory.	Poor	-	67	80	85
	Fair	-	51	63	70
	Good	-	35	47	55
Desert Shrub - Major Plants include Saltbush, Greasewood. Creosotebush, Blackbrush, Bursage, Palo Verde, Mesquite, and Cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

[1]Average runoff condition, and Ia = 0.2S. For range in humid regions, use "SCS Curve Numbers for other Agricultural Lands."
[2]Poor: <30% ground cover (litter, grass, and brush overstory).
Fair: 30% to 70% ground cover.
Good: >70% ground cover.
[3]Curve numbers for group A have been developed only for desert shrub.

CURVE NUMBER CONTINUED

HYDROLOGY CALCULATIONS

ATTACHMENT “D”

STORM WATER MANAGEMENT CALCULATIONS -

PROJECT: ***Project Basie***
DATE: ***5/24/21***
BY: CLJ

COFFMAN ENGINEERS
10 North Post St., Suite 500
Spokane, WA 99201
(509) 328-2994

BASIN: **On-Site Pre-Development**

CONTRIBUTING AREAS AND CURVE NUMBERS

Site 81.81 Acres 3563809 s.f.

	PGIS Areas (s.f.)	Non-PGIS Areas (s.f.)	PGIS Areas (Ac.)	Non-PGIS Areas (Ac.)	Curve Number	A*CN
Asphalt	0	0	0.00	0.00	98	0
Sidewalks	0	0	0.00	0.00	98	0
Building / Roof	0	0	0.00	0.00	98	0
Grass / Landscaping	0	3563809	0.00	81.81	89	7281
Gravel	0	0	0.00	0.00	89	0
			Total A (PGIS)	Total A (Non-PGIS)		Weighted CN
			0.00	81.81		89

Total Impervious 0.00 0%
Total Pervious 81.81 100%

TIME OF CONCENTRATION

Ct =	0.15	Ct = 0.15
L1(A) =	3000	L1 = Length of Overland Flow
N(A) =	0.4	N = friction factor of overland flow (.4 for average grass cover)
S(A) =	0.005	S = average slope of overland flow
Time of Con. (mins) =	51.75	Tc (overland) = Ct*(L1*N/S^0.5)^0.6)

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
5 YEAR - 24 HOUR

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
5YEAR24HR	Intensity	inches	Oregon	Marion	5	3.00	SCS Type 1A 24-hr

Runoff Rate

Peak Flow (cfs)
21.71

STORM WATER MANAGEMENT CALCULATIONS -

PROJECT: ***Project Basie***
DATE: ***5/24/21***
BY: CLJ

COFFMAN ENGINEERS
10 North Post St., Suite 500
Spokane, WA 99201
(509) 328-2994

BASIN: **Off-Site Pre-Development**

CONTRIBUTING AREAS AND CURVE NUMBERS

Site 2.43 Acres 105886 s.f.

	PGIS Areas (s.f.)	Non-PGIS Areas (s.f.)	PGIS Areas (Ac.)	Non-PGIS Areas (Ac.)	Curve Number	A*CN
Asphalt	32143	0	0.74	0.00	98	72
Sidewalks	0	0	0.00	0.00	98	0
Building / Roof	0	0	0.00	0.00	98	0
Grass / Landscaping	0	73743	0.00	1.69	89	151
Gravel	0	0	0.00	0.00	89	0
			Total A (PGIS)	Total A (Non-PGIS)		Weighted CN
			0.74	1.69		92

Total Impervious
0.74 30%

Total Pervious
1.69 70%

TIME OF CONCENTRATION

Time of Con. (mins) = 5.00

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
WATER QUALITY : 2 YEAR - 24 HOUR

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
5YEAR24HR	Intensity	inches	Oregon	Marion	5	3.00	SCS Type 1A 24-hr

Runoff Rate

Peak Flow (cfs)
1.31

STORM WATER MANAGEMENT CALCULATIONS -

PROJECT: ***Project Basie***
DATE: ***5/24/21***
BY: CLJ

COFFMAN ENGINEERS
10 North Post St., Suite 500
Spokane, WA 99201
(509) 328-2994

BASIN: **On-Site Post-Development**

CONTRIBUTING AREAS AND CURVE NUMBERS

Site 81.81 Acres 3563809 s.f.

	PGIS Areas (s.f.)	Non-PGIS Areas (s.f.)	PGIS Areas (Ac.)	Non-PGIS Areas (Ac.)	Curve Number	A*CN		
							Total Impervious	
Asphalt	1587810	0	36.45	0.00	98	3572	57.43	70%
Sidewalks	94175	0	2.16	0.00	98	212		
Building / Roof	0	819774	0.00	18.82	98	1844		
Grass / Landscaping	0	1062050	0.00	24.38	81	1975	Total Pervious	
Gravel	0	0	0.00	0.00	89	0	24.38	30%
			Total A (PGIS)	Total A (Non-PGIS)		Weighted CN		
			38.61	43.20		93		

TIME OF CONCENTRATION

Time of Con. (mins) = 5.00

PROVIDED SWALE GEOMETRY

Swale Number	Bot. Elevation Area (sf)	1' Depth Elevation Area (sf)	2' Depth Elevation Area (sf)	3' Depth Elevation Area (sf)	Top of Swale (1' of Freeboard) Elev. Area (sf)	Total Volume (cf)
North Swale	230243	241128	252071	263070	274125	739856
						739855.5

SUBSURFACE GRAVEL GALLERY

Drain Time	48	hr
Swale Exfiltration Area	230243	sf
Voids in Drainrock	0.3	
Gallery Outflow Rate	4.00	cfs
Soil Infiltration Rate	0.75	in/hr

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
WATER QUALITY : 2 YEAR - 24 HOUR

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
2YEAR24HR	Intensity	inches	Oregon	Marion	2	1.2	SCS Type 1A 24-hr

**50% of the total rainfall depth (inches)*

Storage Summary

Peak Inflow (cfs)	Max Ponding Water Depth* (ft)
14.61	0.94
	Adequate Depth

**maximum treatment water depth in swale shall be maximum of 1 foot depth per City requirements*

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
DETENTION : 25 YEAR - 24 HOUR

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
25YEAR24HR	Intensity	inches	Oregon	Marion	25	4.0	SCS Type 1A 24-hr

Storage Summary

Peak Inflow (cfs)	Max Ponding Water Depth (ft)
66.03	2.72
	Adequate Depth

Metered Orifice Release

Orifice Size (inches)	Orifice Outflow (cfs)
16.00	7.77

**maximum ponding water depth in swale shall be maximum of 3 foot depth per City requirements*

STORM WATER MANAGEMENT CALCULATIONS -

PROJECT: ***Project Basie***
DATE: ***5/24/21***
BY: CLJ

COFFMAN ENGINEERS
10 North Post St., Suite 500
Spokane, WA 99201
(509) 328-2994

BASIN: **On-Site Post-Development**

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
CONVEYANCE AND OVERFLOW

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
100YEAR24HR	Intensity	inches	Oregon	Marion	100	4.5	SCS Type 1A 24-hr

Storage Summary

Peak Inflow (cfs)	Max Ponding Water Depth (ft)
75.77	2.94

Overflow

25 Year Peak Flow (cfs)	100 Year Peak Flow (cfs)	Peak Flow for Weir (cfs)	Weir Size (ft x ft)
66.03	75.77	9.74	2 x 1.5

STORM WATER MANAGEMENT CALCULATIONS -

PROJECT: *Project Basie*
DATE: *5/24/21*
BY: CLJ

COFFMAN ENGINEERS
10 North Post St., Suite 500
Spokane, WA 99201
(509) 328-2994

BASIN: **Off-Site Post-Development**

CONTRIBUTING AREAS AND CURVE NUMBERS

Site 2.43 Acres 105886 s.f.

	PGIS Areas (s.f.)	Non-PGIS Areas (s.f.)	PGIS Areas (Ac.)	Non-PGIS Areas (Ac.)	Curve Number	A*CN
Asphalt	79715	0	1.83	0.00	98	179
Sidewalks	13504	0	0.31	0.00	98	30
Building / Roof	0	0	0.00	0.00	98	0
Grass / Landscaping	0	12667	0.00	0.29	81	24
Gravel	0	0	0.00	0.00	89	0
			Total A (PGIS)	Total A (Non-PGIS)		Weighted CN
			2.14	0.29		96

Total Impervious	2.14	88%
Total Pervious	0.29	12%

TIME OF CONCENTRATION

Time of Con. (mins) = 5.00

PROVIDED SWALE GEOMETRY

Swale Number	Bot. Elevation Area (sf)	1' Depth Elevation Area (sf)	Total Volume (cf)
1	41	332	187
2	615	4348	2482
3	244	1749	997
4	1074	7561	4318
5	53	133	93
Total:	2027	14123	8075

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
WATER QUALITY : 2 YEAR - 24 HOUR

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
2YEAR24HR	Intensity	inches	Oregon	Marion	2	1.2	SCS Type 1A 24-hr

**50% of the total rainfall depth (inches)*

Storage Summary

Peak Inflow (cfs)	Max Ponding Water Depth (ft)
0.55	0.98

Adequate Depth

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
DETENTION : 25 YEAR - 24 HOUR

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
25YEAR24HR	Intensity	inches	Oregon	Marion	25	4.0	SCS Type 1A 24-hr

Storage Summary

Peak Inflow (cfs)	Max Ponding Water Depth (ft)
2.16	0.84

Adequate Depth

Metered Orifice Release

Orifice Size (inches)	Orifice Outflow (cfs)
6.00	0.74

See next page for storage requirement calculations

STORM WATER MANAGEMENT CALCULATIONS -

PROJECT: *Project Basie*
DATE: *5/24/21*
BY: CLJ

COFFMAN ENGINEERS
10 North Post St., Suite 500
Spokane, WA 99201
(509) 328-2994

BASIN: **Off-Site Post-Development**

SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
CONVEYANCE AND OVERFLOW

Rainfall Details

Rain Gage ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)*	Rainfall Distribution
100YEAR24HR	Intensity	inches	Oregon	Marion	100	4.5	SCS Type 1A 24-hr

Storage Summary

Peak Inflow (cfs)	Max Ponding Water Depth (ft)
2.45	0.92

STORM WATER MANAGEMENT CALCULATIONS -

PROJECT: ***Project Basie***
DATE: ***5/24/21***
BY: CLJ

COFFMAN ENGINEERS
10 North Post St., Suite 500
Spokane, WA 99201
(509) 328-2994

BASIN: **Combined Post-Development (Outfall to Senecal Creek)**

CONTRIBUTING AREAS AND CURVE NUMBERS

Site 84.24 Acres 3669695 s.f.

	PGIS Areas (s.f.)	Non-PGIS Areas (s.f.)	PGIS Areas (Ac.)	Non-PGIS Areas (Ac.)	Curve Number	A*CN		
							Total Impervious	
Asphalt	1667525	0	38.28	0.00	98	3752	59.57	71%
Sidewalks	107679	0	2.47	0.00	98	242		
Building / Roof	0	819774	0.00	18.82	98	1844		
Grass / Landscaping	0	1074717	0.00	24.67	81	1998	Total Pervious	
Gravel	0	0	0.00	0.00	89	0	24.67	29%
			Total A (PGIS)	Total A (Non-PGIS)		Weighted CN		
			40.75	43.49		93		

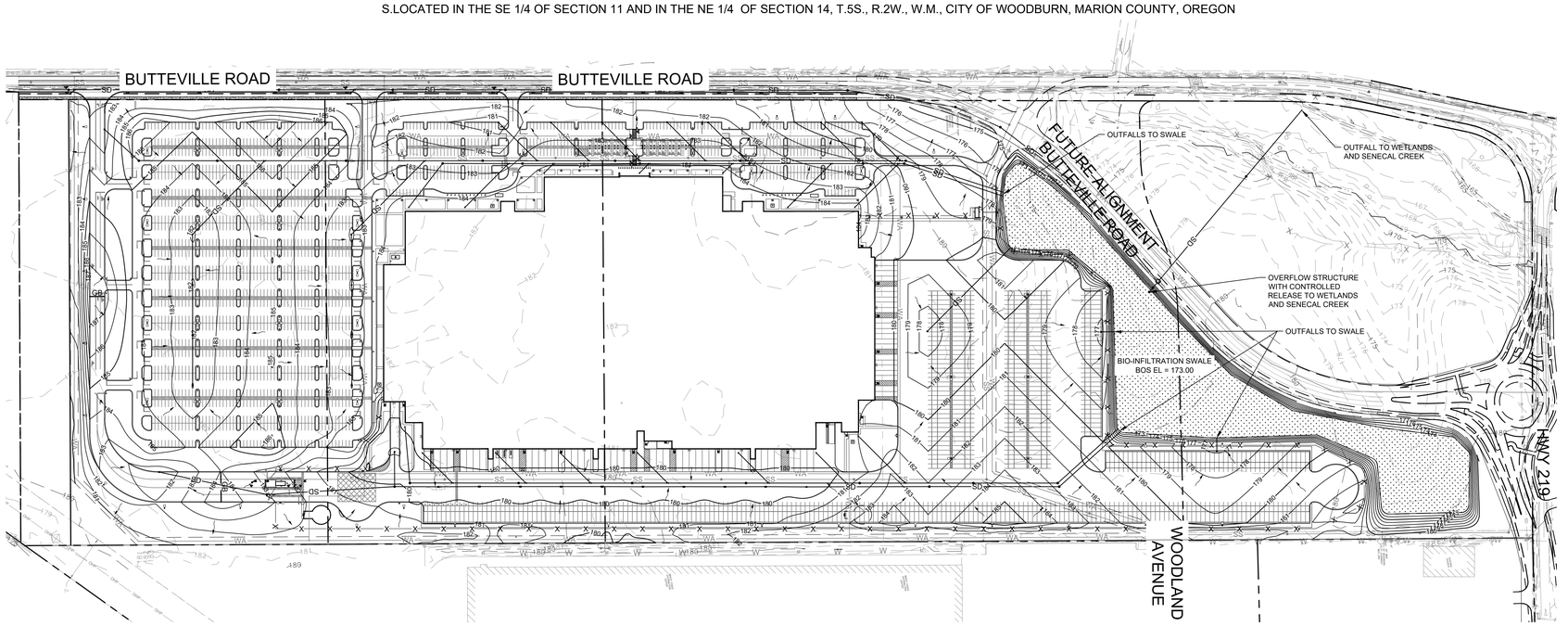
SANTA BARBARA URBAN HYDROGRAPH (SBUH) METHOD RESULTS FROM AUTODESK STORM AND SANITARY ANALYSIS (SSA) SOFTWARE
TOTAL OUTFLOW

Total Proposed On-Site Metered Outflow (cfs)	Total Proposed Off-Site Metered Outflow (cfs)	Total Post-Dev Peak Outflow (cfs)	Total Pre-Dev. Peak Flow (cfs)
21.51	0.74	**22.25**	23.02
			meets requirements

PRELIMINARY OVERALL DRAINAGE PLAN

ATTACHMENT “E”

S.LOCATED IN THE SE 1/4 OF SECTION 11 AND IN THE NE 1/4 OF SECTION 14, T.5S., R.2W., W.M., CITY OF WOODBURN, MARION COUNTY, OREGON



LEGEND

- BIO-INFILTRATION SWALE BOTTOM
- 170 EXISTING CONTOUR
- 170 PROPOSED CONTOUR
- PROPERTY LINE
- SD STORM PIPE
- CATCH BASIN
- ROOF DRAIN CONNECTION
- STORM DRAIN MANHOLE
- CURB INLET

AREA 1	AREA 2	AREA 3	AREA 4	AREA 5
AREA 10	AREA 9	AREA 8	AREA 7	AREA 6
AREA 11	AREA 12	AREA 13	AREA 14	AREA 15

KEY PLAN

150 75 0 150 300

SCALE: 1 INCH = 150 FEET

TBM INFORMATION

REFER TO TOPOGRAPHIC SURVEY FOR MORE INFORMATION, SHEETS C0.04-C0.09.

THE EXISTING INFORMATION SHOWN ON THESE PLANS IS PER THE SURVEY COMPLETED BY:
KC DEVELOPMENT
P.O. BOX 398
CAMAS, WA 98607
(360)-834-2519
DATED: 06/27/2016
THE CONTRACTOR SHALL VERIFY EXISTING SITE CONDITIONS AND CONTACT THE ENGINEER IF DISCREPANCIES ARE NOTED.

UTILITY STATEMENT

LOCATION OF EXISTING UNDERGROUND UTILITIES HAVE BEEN TAKEN FROM DRAWINGS AND FIELD LOCATES SUPPLIED BY THE APPROPRIATE UTILITY COMPANIES. UTILITY LOCATIONS SHOWN ON THIS DRAWING ARE APPROXIMATE ONLY. PRIOR TO BEGINNING ANY CONSTRUCTION, THE CONTRACTOR SHALL VERIFY THE EXACT LOCATION OF EACH UTILITY.

811 Know what's below. Call before you dig.

TC PURSUIT SERVICES, INC. | PROJECT BASIE
WOODBURN, OR
2210133.00

Trammell Crow Company

MACKENZIE.

COFFMAN ENGINEERS

lango.hansen LANDSCAPE ARCHITECTS PC

OVERALL DRAINAGE PLAN

TYPE III DESIGN REVIEW APPLICATION: 05/24/2021

C-500